

Preliminary Assessment of Avifaunal Diversity and their Feeding Guilds around Kedar Dam in Sarangarh Forest Range, Chhattisgarh

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Received: 30 Apr 2025; Received in revised form: 27 May 2025; Accepted: 03 Jun 2025; Available online: 09 Jun 2025

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Abstract— Avifaunal Diversity is one of the most important ecological indicators to evaluate the status of habitats. They act as potential bio-indicators and ideal models for predicting environmental changes. The present study investigates the avifaunal diversity along with their feeding behaviour around Kedar Dam constructed in 1971 as part of an irrigation project in the Mahanadi basin, Chhattisgarh. The reservoir's habitat provides rich food sources, including nectar, seeds, fruits, insects, fish, reptiles, and forest tree fruits, supporting various avian species around it. The complete study was conducted during the summer season from March 2023 to July 2023 and as result, a total of 55 individual bird species, spanning 15 orders and 31 families, were recorded in the study site. Among these, most of the birds were found omnivore (18 species) feeding on both plants and insects followed by carnivores, granivores, frugivores and insectivores (7 species each) and least species were found as nectarivores (5 species) in the study site. Based on the results, it was also found that omnivores showed maximum diversity ($H_{max}=3.426$) followed by insectivores ($H_{max}=2.465$) and then granivores ($H_{max}=2.159$). It was also found that omnivores showed higher diversity and equitability ($H'=3.101$, $J=0.6945$) than other species. Notably, the Alexandrine Parakeet (*Psittacula eupatria*), classified as Near Threatened (NT) by the IUCN, was documented. The findings emphasize the importance of the dam's habitat for avian conservation and biodiversity.

Keywords— Avifaunal Diversity, Feeding Behaviour, Bio-indicators, Wetland, Conservation.

I. INTRODUCTION

The most well-known group of vertebrates, birds are found in almost all environments on earth and contribute significantly to the ecology (Aloysius *et al.*, 2023). The Indian subcontinent's highly variable climate, diverse habitat, and extensive stretches of vegetation draw and sustain a wide variety of avifauna throughout the year, including a significant number of unique species. The Indian subcontinent is home to around 1,300 species of birds, or more than 13% of all bird species in the world, out of a total of over 9,000 species. India's subcontinent is renowned

for its rich and diverse ecosystems, hosting an impressive array of bird species.

Birds, as warm-blooded vertebrates with specialized adaptations like feathery wings, are integral to ecological systems, functioning as pollinators, bio-indicators, and critical links in food webs (Amat and Green, 2010; Bensizerara *et al.*, 2013). Their fascinating coloration, behaviour, and songs have historically captured human imagination. However, this diversity is increasingly under threat due to habitat destruction caused by urbanization, agricultural expansion, and industrial development (Edison *et al.*, 2016). Deforestation, which eliminates

nesting and feeding sites, and human disturbances such as noise pollution (Anthony and Tiwari, 2022), hunting, and unregulated tourism further exacerbate the decline of bird populations. The loss of avifaunal diversity not only disrupts ecosystem functions but also diminishes the aesthetic and cultural value of natural landscapes (Maitry *et al.*, 2023), calling for immediate conservation efforts to protect and restore their habitats.

Recognizing the significance of birds for ecosystem health, the current study examines the bird diversity in and around Kedar Dam in Sarangarh Forest Range, areas characterized by a blend of agricultural, forest, and wetland habitats. The use of short-term studies to quantify biodiversity is becoming more common, and in this context, creating more comprehensive bird checklists has been given significant weight (Vishwakarma *et al.*, 2021, Chandrakar and Dhuria, 2019). Other than that, understanding the feeding behaviour of avifauna is critical for unravelling their ecological roles and interactions within an ecosystem (Abbas *et al.*, 2019).

Feeding behaviour reflects the dietary preferences, foraging strategies, and resource partitioning of bird species, which are influenced by habitat conditions, seasonal food availability, and competition (Henson *et al.*, 2023, Panda *et al.*, 2021). Studying these behaviours not only aids in identifying the ecological niches of various bird species but also highlights their contributions to ecosystem functions such as pest control, seed dispersal, and nutrient cycling (Visscher *et al.*, 2018). This research aims to document avifaunal diversity, identify conservation needs, and evaluate the role of Kedar Dam's ecosystem in supporting resident and migratory birds and analyse their feeding behaviour in relation to the habitat features and available food resources. The findings of this study are expected to provide valuable baseline data for future ecological research and contribute to the conservation and management of avian habitats in the region.

II. MATERIALS AND METHODS

Description of the study area

Kedar Dam is located 8 km from Sarangarh town on the Sarangarh-Bilaspur route (130B) lying between latitude 21°33'52" to 21°33'36" N and longitude

82°58'25" to 82°58'40" E in Kedar village of Sarangarh-Bilaigarh district of Chhattisgarh, India (Figure 1). Constructed in 1971 in the Mahanadi basin, the length of the dam is 792 m and its maximum height above foundation is about 20.12 meters and the dam serves as an irrigation reservoir, supporting agriculture and surrounding habitats. The study area encompasses compartments 1054, 1055, 1034, and 1035 of the Sarangarh Forest Range, providing diverse habitats including grasslands, forest patches, and agricultural fields. These wetland habitats support a variety of avian species that exhibit distinct foraging patterns based on resource availability (Bachheti *et al.*, 2023, Maitry *et al.*, 2023).

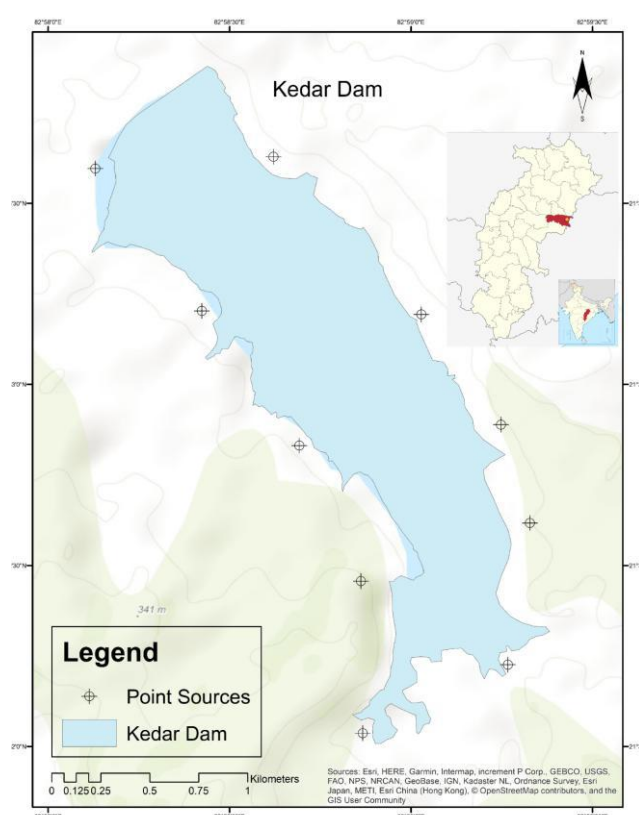


Fig. 1: Geographical location of the study site with point sources for the study of avifaunal diversity.

The area's tree cover mainly includes species like Peepal (*Ficus religiosa*), Banyan (*Ficus benghalensis*), Mango (*Mangifera indica*), Palash (*Butea monosperma*), and Amaltas (*Cassia fistula*), providing shelter and food for various bird species. The proximity of water bodies, agricultural fields, and forested areas creates a conducive environment for avifaunal richness.

Methodology

The study was conducted from March to July 2023, spanning 100 hours of observation. Birds were recorded using the direct walk count method and point count method (in and around 10 well established observation point, shown in Figure 1) during their most active periods: early morning (0600–0800 hrs) and early evening (1600–1800 hrs). Observations were made with Nikon Aculon 22x50 binoculars and a Nikon B600 camera, supplemented by field notes and the Merlin Bird ID app for species identification. Sampling strategies involved randomized sampling across forested, agricultural, and waterbody-adjacent areas. Surveys were concentrated along accessible north-south routes and cross-verification with avian experts ensured reliable identification. Birds were classified into feeding guilds and conservation status based on the IUCN Red List. Anthropogenic disturbances were minimized to ensure natural behaviour during observations.

Data analysis

The data recorded were analysed by using Shannon-Wiener general diversity index formula; species diversity (H'), maximum diversity ($H_{\max}$), and equitability or evenness (J) using SPSS V25 software.

$$H' = \sum_{i=1}^S (p_i \log p_i)$$

$$H_{\max} = \log s$$

$$J = H' / H_{\max}$$

S = The number of species (species richness)

n = The total number of individuals of all species

p_i = The relative abundance of each species (n_i/N)

III. RESULTS AND DISCUSSION

A total of 55 bird species from 15 orders and 31 families were recorded, including 54 resident species and one summer visitor (Table 1). The most represented order was Passeriformes, accounting for 19 species across 13 families. Other notable orders included Pelecaniformes (3 families), and Coraciiformes (3 families) with 5 species each whereas Columbiformes order with 6 species. One species, the Alexandrine Parakeet (*Psittacula eupatria*), is listed as Near Threatened. This highlights the conservation value of the site for species requiring protection (Pattnaik *et al.*, 2022). Bird density was highest near the dam, attributed to year-round water availability and the abundance of food resources (Bachheti *et al.*, 2023, Rai, 2021). Conversely, forested areas 100 m away from the dam exhibited lower avian densities. Agricultural lands and scattered trees served as supplemental habitats, offering feeding and nesting sites (Bensizerara *et al.*, 2013). Based on the feeding behaviour, most of the birds were found omnivore (18 species) feeding on both plants and insects followed by carnivores, granivores, frugivores and insectivores (7 species each) and least species were found as nectarivores (5 species) in the study site (Table 2).

Table 1: Checklist of Avian species observed in Kedar Dam and nearby areas.

S N	Order	Family	Common Name	Scientific Name	Status
1.	Anseriformes	Anatidae	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	LC
2.	Galliformes	Phasianidae	Indian Peafowl	<i>Pavo cristatus</i>	LC
3.	Columbiformes	Columbidae	Rock Pigeon	<i>Columba livia</i>	LC
4.		Columbidae	Red Collared Dove	<i>Streptopelia tranquebarica</i>	LC
5.		Columbidae	Laughing Dove	<i>Spilopelia senegalensis</i>	LC
6.		Columbidae	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	LC
7.		Columbidae	Yellow-footed Green Pigeon	<i>Treron phoenicopterus</i>	LC
8.		Columbidae	Spotted Dove	<i>Spilopelia chinensis</i>	LC
9.	Caprimulgiformes	Caprimulgidae	Indian Nightjar	<i>Caprimulgus asiaticus</i>	LC

10.		Caprimulgidae	Savanna Nightjar	<i>Caprimulgus affinis</i>	LC
11.	Cuculiformes	Cuculidae	Greater Coucal	<i>Centropus sinensis</i>	LC
12.		Cuculidae	Asian Koel	<i>Eudynamis scolopaceus</i>	LC
13.		Cuculidae	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	LC
14.	Gruiformes	Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	LC
15.	Pelecaniformes	Ardeidae	Indian Pond Heron	<i>Ardeola grayii</i>	LC
16.		Ardeidae	Cattle Egret	<i>Bubulcus ibis</i>	LC
17.		Ardeidae	Little Egret	<i>Egretta garzetta</i>	LC
18.		Threskiornithidae	Red-naped Ibis	<i>Pseudibis papillosa</i>	LC
19.		Phalacrocoracidae	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	LC
20.	Charadriiformes	Charadriidae	Little Ringed Plover	<i>Charadrius dubius</i>	LC
21.		Charadriidae	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	LC
22.		Charadriidae	Red-wattled Lapwing	<i>Vanellus indicus</i>	LC
23.	Accipitriformes	Accipitridae	Shikra	<i>Accipiter badius</i>	LC
24.		Accipitridae	Black Kite	<i>Milvus migrans</i>	LC
25.	Strigiformes	Strigidae	Spotted Owlet	<i>Athene brama</i>	LC
26.		Strigidae	Jungle Owlet	<i>Glaucidium radiatum</i>	LC
27.	Bucerotiformes	Bucerotidae	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	LC
28.	Piciformes	Megalaimidae	Brown-headed barbet	<i>Psilopogon zeylanicus</i>	LC
29.		Megalaimidae	Coppersmith barbet	<i>Psilopogon haemacephalus</i>	LC
30.	Coraciiformes	Meropidae	Green Bee-eater	<i>Merops orientalis</i>	LC
31.		Coraciidae	Indian Roller	<i>Coracias benghalensis</i>	LC
32.		Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>	LC
33.		Alcedinidae	Pied Kingfisher	<i>Ceryle rudis</i>	LC
34.		Alcedinidae	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	LC
35.	Psittaciformes	Psittaculidae	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	LC
36.		Psittaculidae	Alexandrine Parakeet	<i>Psittacula eupatria</i>	NT
37.	Passeriformes	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>	LC
38.		Leiothrichidae	Jungle Babbler	<i>Argya striata</i>	LC
39.		Corvidae	House Crow	<i>Corvus splendens</i>	LC
40.		Corvidae	Rufous Treepie	<i>Dendrocitta vagabunda</i>	LC
41.		Corvidae	Indian Jungle Crow	<i>Corvus culminates</i>	LC

42.		Monarchidae	Indian Paradise Flycatcher	<i>Terpsiphone paradise</i>	LC
43.		Nectariniidae	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>	LC
44.		Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i>	LC
45.		Estrildidae	Indian Silverbill	<i>Euodice malabarica</i>	LC
46.		Motacillidae	White Wagtail	<i>Motacilla alba</i>	LC
47.		Cisticolidae	Ashy Prinia	<i>Prinia socialis</i>	LC
48.		Cisticolidae	Plain Prinia	<i>Prinia inornata</i>	LC
49.		Hirundinidae	Red-rumped Swallow	<i>Cecropis daurica</i>	LC
50.		Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>	LC
51.		Vangidae	Common Woodshrike	<i>Tephrodornis pondicerianus</i>	LC
52.		Sturnidae	Brahminy Starling	<i>Sturnia pagodarum</i>	LC
53.		Sturnidae	Common Myna	<i>Acridotheres tristis</i>	LC
54.		Muscicapidae	Indian Robin	<i>Saxicoloides fulicatus</i>	LC
55.		Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>	LC

LC- Least Concern, NT- Near Threatened

The observed variations in diversity among trophic groups reflect the ecological complexity and resource availability within the studied ecosystem. Omnivores demonstrated the highest diversity ($H_{\max}=3.426$) compared to insectivores ($H_{\max}=2.465$) and granivores ($H_{\max}=2.159$). Rest of the feeding behaviours showed negligible diversity and hence omitted in this research. This trend may be attributed to the ecological plasticity of omnivores, which allows them to exploit a broad range of food resources, including both plant and animal matter (Smith *et al.*, 2015). Their ability to switch between dietary sources ensures resilience against seasonal variations in resource availability, enabling their dominance in terms of diversity (Panda *et al.*, 2021).

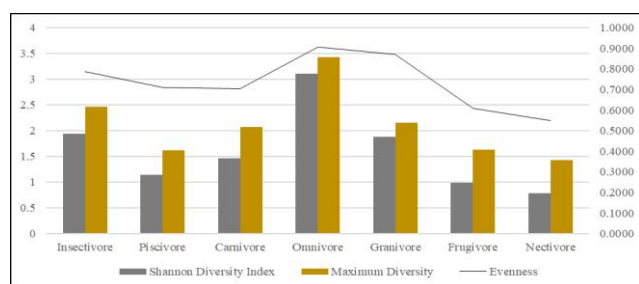


Fig. 2: Graphical representation of various diversity indices for different feeding guilds.

In terms of equitability, omnivores also exhibited a higher Shannon diversity index ($H'=3.101$) and Pielou's equitability index ($J=0.9051$) than other trophic groups (Figure 2). These values indicate that not only are omnivores diverse, but their populations are also more evenly distributed across species (Ortega-Álvarez and Casas, 2022). This finding aligns with studies by Jones and Lacey (2018), who noted that trophic groups with broader dietary niches tend to display higher equitability due to reduced interspecific competition. Insectivores, while less diverse (Brown *et al.*, 2013), still showed moderate levels of Shannon diversity index ($H'=1.942$). This may be linked to the specialized feeding strategies and habitat preferences that limit their adaptability but confer advantages in specific niches with abundant insect prey (Brown *et al.*, 2013). Granivores, on the other hand, recorded the lowest Shannon diversity index ($H'=1.876$) among top three, which could be explained by the dependence on agricultural seed availability that is often influenced by seasonal variations and anthropogenic factors such as agriculture (Taylor *et al.*, 2017).

Table 2: Feeding Guild Distribution in Kedar Dam.

S. No.	Feeding Guild	Behaviour	Number of species	Morphology of beaks
1.	Insectivore	Primarily feed on insects	7	
2.	Piscivore	Primarily consume fish	6	
3.	Carnivore	Feed on other animals, including mammals, reptiles, and other birds	7	
4.	Omnivore	Consume a varied diet including plants, fruits, insects, and small animals	18	
5.	Granivore	Primarily eat seeds and grains	7	
6.	Frugivore	Mainly feed on fruits	7	
7.	Nectivore	Feed on nectar from flowers	3	

Agglomerative hierarchical clustering was done using SPSS software (version 25.0) for classifying the feeding behaviour of birds based on similarities and dissimilarities (Figure 3). The dendrogram represents a hierarchical cluster analysis (HCA) of seven bird feeding behaviours: Piscivore, Frugivore, Nectarivore, Insectivore, Granivore, Carnivore, and Omnivore. Using the average linkage method (between groups) and rescaled distance metrics, the analysis clusters these feeding behaviours based on their similarity. The closer two behaviours are on the dendrogram, the more similar they are in terms of ecological traits or dietary preferences. At the lowest rescaled distance, Granivores and Insectivores show

close clustering (3.167), suggesting high similarity in their ecological roles or resource usage.

Nectarivores merge with this cluster at a slightly higher distance (4.667), indicating a moderate degree of similarity, possibly due to shared insect or plant-based dietary components. Frugivores cluster with the aforementioned group at a higher distance, reflecting their broader reliance on plant-derived resources. Carnivores and Piscivores, with specialized dietary niches, merge at a greater distance, highlighting their distinct feeding behaviours. Finally, Omnivores, with their highly generalized diet, integrate into the cluster at the highest rescaled distance, reflecting their broad dietary adaptability.

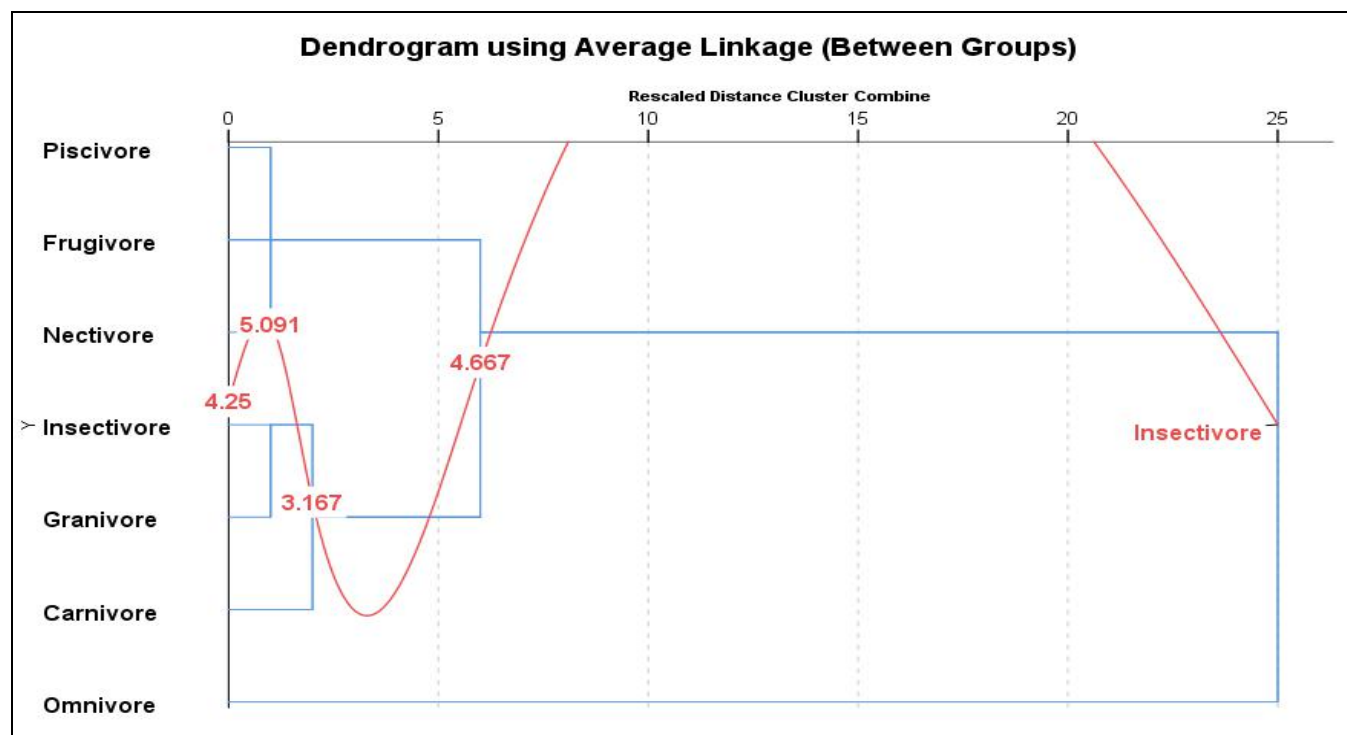


Fig. 3: Agglomerative hierarchical cluster based dendrogram classifying the feeding behaviour of birds.



Fig. 4: Some notable avifaunal species photographed in the study site.

IV. CONCLUSION

Kedar Dam's ecosystem demonstrates significant avifaunal richness, with omnivorous species being the most dominant feeding guild. The dam's water

availability and surrounding tree cover are crucial factors supporting avian diversity, particularly during the summer season. High bird density near water bodies underscores the role of wetland habitats in sustaining biodiversity. Compared to other forest areas, the dam's proximity to agricultural fields provides a unique habitat mosaic, fostering interactions between avian species and their environment. The study highlights Kedar Dam as a critical habitat for avian diversity, supporting 55 species across various feeding guilds. The presence of a Near Threatened species underscores the ecological significance of the site, necessitating targeted conservation efforts. Challenges include habitat fragmentation and human-induced disturbances. The results suggest that trophic diversity is a critical indicator of ecosystem health, with omnivores serving as a keystone group due to their role in stabilizing food web dynamics. The dendrogram provides insight into the ecological diversity and potential interactions among bird feeding behaviours, aiding in understanding resource partitioning and ecological balance within avian communities. Further studies incorporating factors such as habitat heterogeneity, resource distribution, and anthropogenic pressures are

essential to understand the ecological implications of these findings. Conservation measures should prioritize habitat preservation, afforestation, and minimizing anthropogenic impacts to ensure long-term sustainability of avifaunal populations.

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